

# Investments

## Valuation of Stocks

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# Objectives

- Apply valuation models to equity.
  - Intrinsic models
    - Dividend Discount model
    - Gordon Growth model
  - Relative valuation
    - Analysis of P/E, P/S, EV/EBITDA, etc.
- Use Gordon Growth model to understand fundamentals.
  - Learn to infer implied required returns and growth rates from market prices.
  - Model growth as a function of ROE and dividend reinvestment rates.
- Understand the drivers behind P/E ratios
- Explain the strengths and weaknesses of the intrinsic value and relative valuation methods

# Measures of Equity Value

- **Book value:** From accounting statements, the book value of the entire firm less the book value of liabilities
  - Firm value according to the accounting statements.
- **Liquidation value:** What shareholders would get if the firm were liquidated and liabilities were paid off
  - Serves as a lower bound on firm value
- **Replacement value:** Replacement cost of assets minus the replacement cost of liabilities

## Our Focus:

- **Intrinsic value:** Valuation of (estimated) cash flows

# **INTRINSIC VALUATION OF EQUITY**

# Intrinsic Value: Back to Basics ...

- In intrinsic valuation, you value an asset based upon its fundamentals (or intrinsic characteristics).
- For cash flow generating assets, the intrinsic value will be a function of the magnitude of the expected cash flows on the asset over its lifetime and the uncertainty about receiving those cash flows.
- Discounted cash flow valuation is a tool for estimating intrinsic value, where the expected value of an asset is written as the present value of the expected cash flows on the asset, with either the cash flows or the discount rate adjusted to reflect the risk.

# Intrinsic Value: Back to Basics ...

- Assuming a constant discount rate ( $r$ ), the value of any asset is the discounted present value of future cash flows (CF)

$$P_0 = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots$$

# Cash Flows to a Stock Investor

- The cash flows to a stock investor with a finite time horizon include:
  - Expected future dividends
  - Expected future selling price ( $P_T$ )
- Assuming a 1-year holding period, this gives

$$P_0 = \frac{D_1}{(1+r)} + \frac{E(P_1)}{(1+r)}$$

- What about  $P_1$ ?

$$P_1 = \frac{D_2}{(1+r)} + \frac{E(P_2)}{(1+r)}$$

# Dividend Discount Model (DDM)

- Continuing this method ...

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_T}{(1+r)^T} + \frac{P_T}{(1+r)^T}$$

- Assuming a constant discount rate ( $r$ ), the value of a share of stock is the discounted present value of all ***expected*** future dividends

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \dots = \sum_{t=1} \frac{D_t}{(1+r)^t}$$

**We assume constant discount rates, but we have not assumed anything about dividend growth rates.**



# Constant (Gordon) Growth Model

- The DDM simplifies when growth ( $g$ ) is constant:

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \dots$$

$$P_0 = \frac{D_0(1+g)}{(1+r)} + \frac{D_0(1+g)^2}{(1+r)^2} + \frac{D_0(1+g)^3}{(1+r)^3} + \dots$$

$$P_0 = D_0 \left[ \frac{(1+g)}{(1+r)} + \frac{(1+g)^2}{(1+r)^2} + \frac{(1+g)^3}{(1+r)^3} + \dots \right]$$

$$P_0 = D_0 \left[ \frac{1+g}{r-g} \right] = \frac{D_1}{r-g}$$

# Gordon Growth Model

$$P_0 = \frac{D_1}{r - g}$$

- It must be that  $g < r$ .
  - Why? What are the limits on  $g$ ?
  - What do we do if a firm is growing at a really fast rate?
- What is the appropriate discount rate ( $r$ )?
  - Investors' required rate of return (their opportunity cost), or, equivalently, the company's cost of equity
  - Can back out the ***implied*** expected return (given  $P_0$  and assumptions for  $g$  and  $D_1$ ):  $r = \frac{D_1}{P_0} + g$

# Gordon Growth Model

$$P_0 = (\text{'No growth' value per share}) + PV(\text{Growth options})$$

The “*No-growth value per share*” is the value of assets already in place or the value of the firm considered as a “cash-cow”:  $\frac{E_1}{r}$

$PV(\text{Growth Options})$  is the **present value of growth opportunities**:

$$P_0 - \frac{E_1}{r}$$

How does the difference between ROE and  $r$  impacts PVGO?

- Growth enhances company value only if it is achieved by investment in projects with attractive profit opportunities (meaning  $ROE > r$ )

# Inferring growth rates from prices

- **Example:** In late-August '18, Apple's stock was priced at \$215. The company paid dividends of \$3.00 over the last year, and let's say investors expect a return of 8%.
- What is the market's implied (constant) growth rate of Apple's future dividends?

$$g = r - \frac{D_1}{P_0} = 0.08 - \frac{3.00(1 + g)}{202.00}$$
$$g = 6.42\%$$

# Modelling growth from fundamentals

- How do we determine the growth rate  $g$ ?
  - Assume earnings  $EPS_1$  at  $t=1$ , plowback ratio of  $b$ , and payout ratio of  $1-b$ 
    - i.e.,  $b$  of every dollar earned is reinvested and  $1-b$  is paid out
  - Assume a constant perpetual return of  $ROE$  on its reinvestment of  $b \times EPS_1$

- The second year's earnings will equal

$$EPS_1 + EPS_1 \times b \times ROE = EPS_1 \times (1 + b \times ROE)$$

- **Growth rate?**

$$g = \frac{EPS_1(1 + b \times ROE)}{EPS_1} - 1 = b \times ROE$$

# Modelling growth from fundamentals

- How do we determine the growth rate  $g$ ?

- Define Return on Equity (ROE) as

$$ROE = \frac{\text{Earnings}}{\text{Book value of Equity}}$$

- Assume

1. A firm has earnings of  $EPS_1$  at  $t=1$
2. ROE doesn't change over the life of the firm
3. A plowback ratio (or retention ratio) of  $b$ , and payout ratio of  $1-b$ 
  - i.e.,  $b$  of every dollar earned is reinvested and  $1-b$  is paid out

# Modelling growth from fundamentals

- The second year's earnings will equal

$$EPS_2 = EPS_1 + \text{growth}$$

$$EPS_2 = EPS_1 + (EPS_1 \times b \times ROE)$$

$$EPS_2 = EPS_1 \times (1 + b \times ROE)$$

- **Growth rate?**

$$g = \frac{EPS_2}{EPS_1} - 1 = \frac{EPS_1(1 + b \times ROE)}{EPS_1} - 1 = b \times ROE$$

# We can use this $g$ implied by fundamentals to derive the (Fundamental) P/E Ratio

- Let:

- $EPS_t$  = earnings per share
- $b$  = plowback ratio
- $1-b$  = payout ratio
- ROE = return on equity

- Where

- $D_t$  =  $EPS_t \cdot (1-b)$
- $g$  =  $ROE \cdot b$

- Substitute into the Gordon Growth Model



# Deriving the P/E Ratio (cont'd)

- Substitutions yield:

$$P_0 = \frac{EPS_1(1-b)}{r-g}$$

$$P_0 = \frac{EPS_1(1-b)}{r-b \times ROE}$$

- Now, divide both sides by  $EPS_1$

# Fundamental P/E Ratio

$$\frac{P_0}{EPS_1} = \frac{(1-b)}{r - b \times ROE}$$

- What can we learn from this simple relationship?
  - Higher cost of equity ( $r$ ), i.e. higher risk  $\Rightarrow$  lower P/E ratio
  - Higher ROE  $\Rightarrow$  higher growth  $\Rightarrow$  higher P/E ratio
- **Intuitively:** What about a higher payout ratio ( $1-b$ )?  
(hint: think about the relationship between ROE and  $r$ )

# Fundamental P/E Example

- In August '12
  - Exxon's stock was priced at \$87.20. P/E ratio of 9.16.
  - Expected to earn \$8.09 the next year, assume a constant ROE of 29.02%, plowback/reinvestment rate of 17%, and an expected return of 8%.
- Assuming 29.02% ROE and reinvestment rate of 17%...
  - What is Exxon's fundamentally justified P/E ratio?
$$\frac{P_0}{EPS_1} = \frac{1-0.17}{0.08-0.2902 \times 0.17} = 27.07$$
  - How does it compare with its P/E ratio? Buy XOM?
    - Over next year XOM → 1.5% vs. SPY → 20.5%

# DDM: Firm isn't paying dividends?

- The trick is to project when you think the company will start paying dividends and how much the dividends will be at that time.
- One place to start is comparing to similar firms.
  - Think of other firms that in their *past* were similar to your firm *now*.
  - How long did it take them to start paying dividends?
  - When they did start paying dividends, what was the dividend payout ratio?
- Also consider if there is a particular reason the firm does not pay dividends. Maybe it just stopped paying during a couple of bad years and will start paying dividends again soon.
- Thus if you project the following, you're getting towards what you need:
  1. Earnings (or some other measure of cash flows available to equity)
  2. When the firm will start paying dividends
  3. What fraction of earnings will be paid out in dividends when they start paying them.

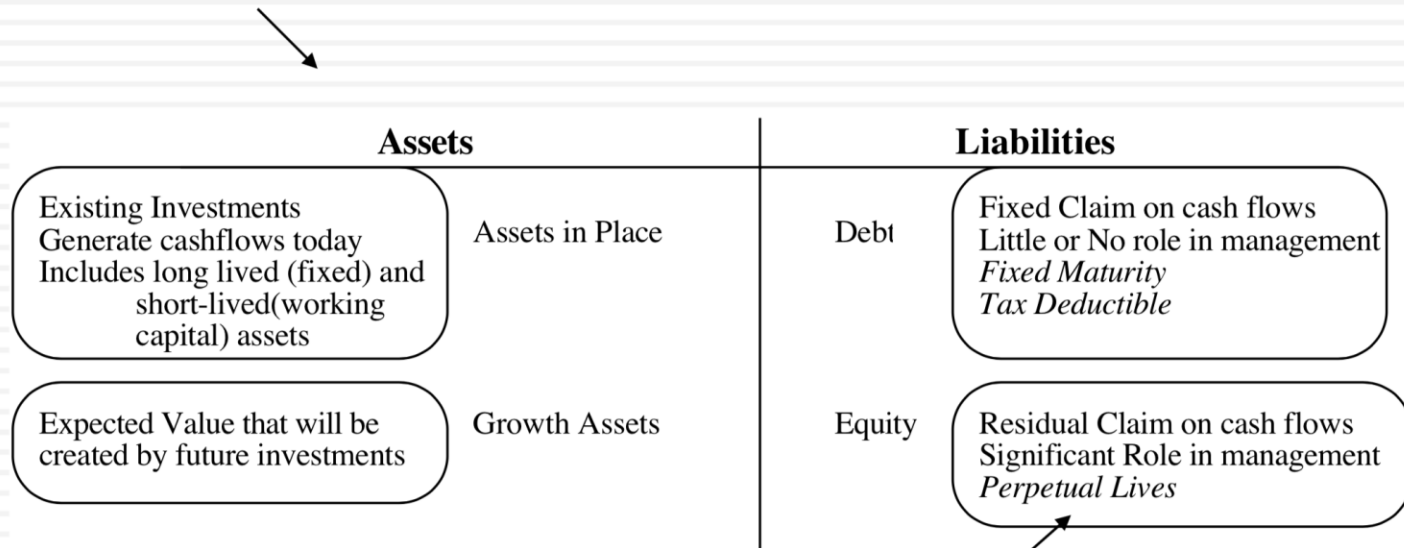
You then also need to forecast dividend growth from that point forward.

# DDM Limitations

- The DDM's practical utility is constrained by the difficulty of forecasting dividend growth in the long term (and also, to some extent, estimation of  $r$ )
  - E.g., when will start-up  $X$  start paying dividends?
- Broadly defined variables
  - Earnings, or Free Cash Flow, or ...
  - Constant ROE?
- Nonetheless, the Gordon model is often used in practice to estimate a ***terminal value*** after explicit forecasts of near-term dividends (5-10 yrs)

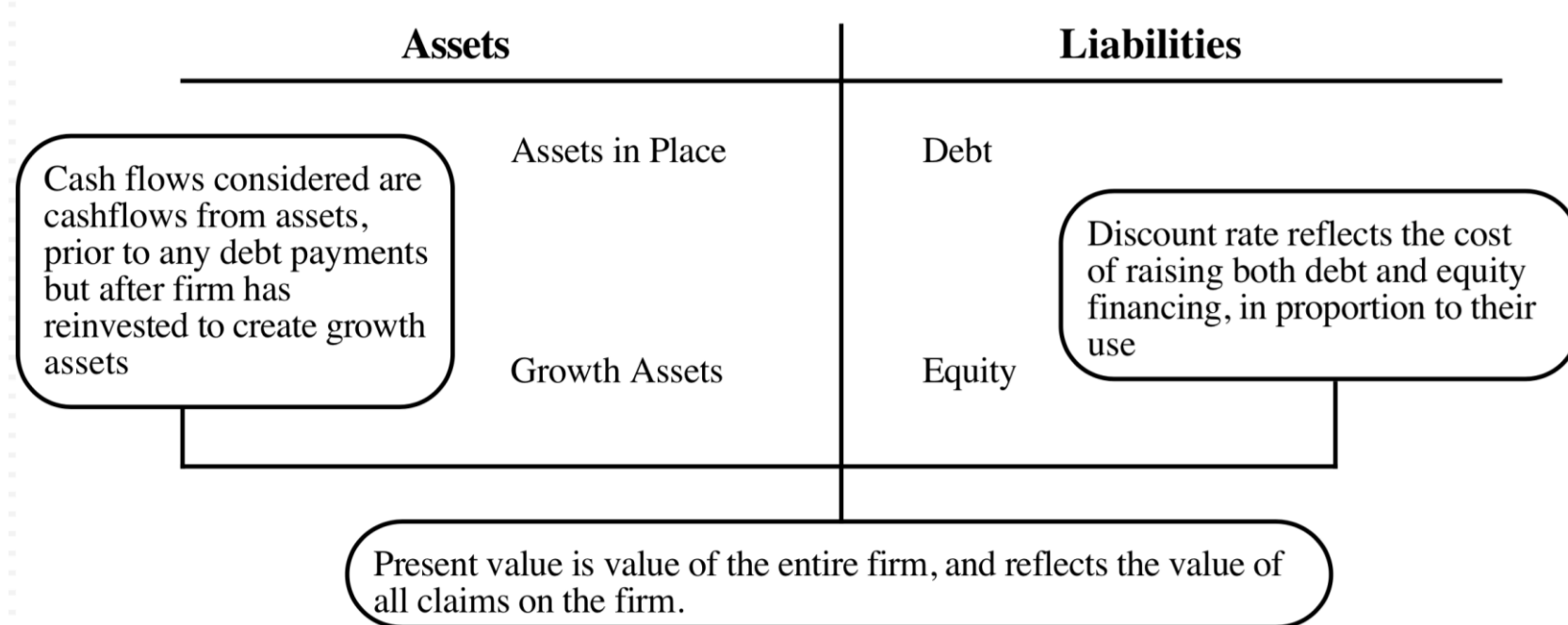
# DCF Choices: Equity Valuation versus Firm Valuation

**Firm Valuation:** Value the entire business



**Equity valuation:** Value just the equity claim in the business

# Firm Value

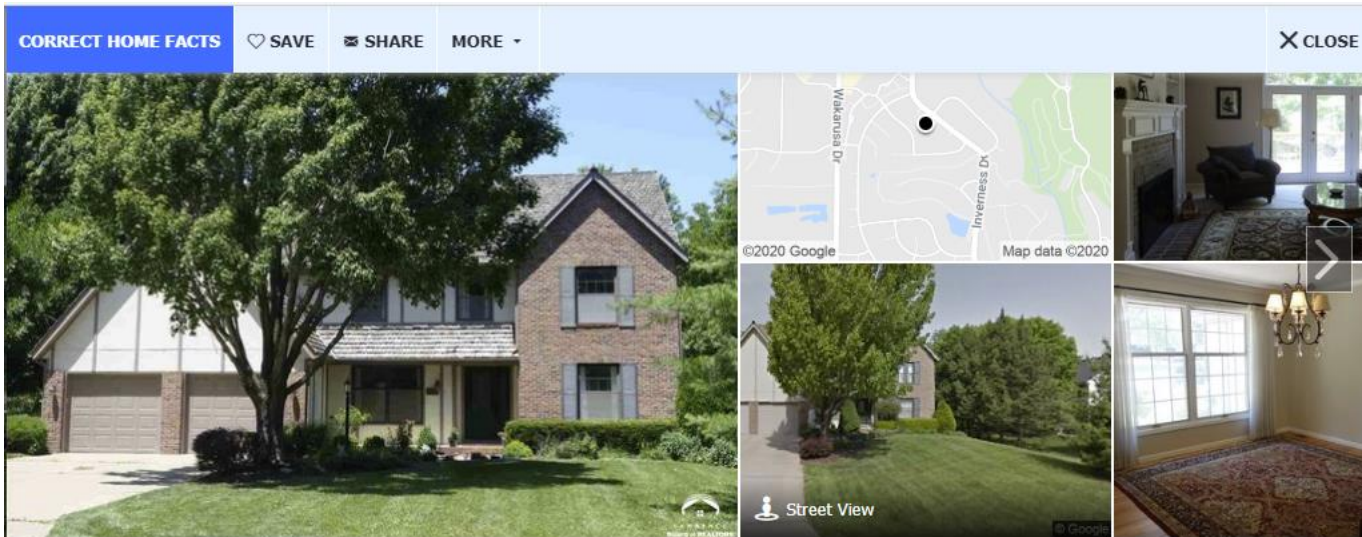


*Much more on this in the Corporate Finance course*

# RELATIVE VALUATION



# Relative Valuation



**4 beds · 4 baths · 4,061 sqft**

*Note: This property is not currently for sale or for rent on Zillow. The description below may be from a previous listing.*

Wonderful, well maintained, one owner home with huge functional space. Lots of upgrades throughout. 4061 sq. feet, 4 BR/4 Bath w/large kitchen/hearth room, living room, 2 wood burning fireplaces, dining & office all on the main. Basement has 2 large entertainment spaces, & plenty of storage. All on a quiet cul-de-sac w/mature trees & landscaped back yard/patio/decks. Great value!

**SOLD**

Sold on 07/21/17

Zestimate®: \$398,753

EST. MORTGAGE

\$1,783/mo

[Get pre-qualified](#)

**SOLD: \$420,500**

Sold on 04/01/19

4 bds, 4 ba, 4,300 sqft

[1317 Pinehurst Cir, Lawrence, KS 66049](#)

**SOLD: \$380,000**

Sold on 08/23/19

4 bds, 4 ba, 3,550 sqft

[1236 Inverness Dr, Lawrence, KS 66049](#)

**SOLD: \$408,000**

Sold on 03/26/19

4 bds, 4 ba, 3,794 sqft

[1232 Belair Ct, Lawrence, KS 66049](#)

# Other valuation approaches: comparables

- Idea: look at the relative valuation of similar companies and apply the average to the firm you are studying
- Does this approach make sense: it all depends on how similar you feel you are to the other companies
- Of course, it is possible to make adjustments because you feel that your company should be trading at a higher or lower multiple relative to other companies
- Advantage:
  - Easy

# Other valuation approaches: comparables

- In relative valuation, the value of an asset is compared to the values assessed by the market for similar or comparable assets.
- To do relative valuation then,
  - We need to identify comparable assets and obtain market values for these assets.
  - Convert these market values into standardized values, since the absolute prices cannot be compared. This process of standardizing creates price multiples.
  - Compare the standardized value or multiple for the asset being analyzed to the standardized values for comparable asset
  - Controlling for any differences between the firms that might affect the multiple, to judge whether the asset is under or over valued .

# Relative Valuation: pros and cons

- Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
  - investing on “momentum” based strategies
- Multiples are just standardized estimates of price...
- Relative valuation generally requires less information than discounted cash flow valuation (especially when multiples are used as screens).

# The Four Steps to Deconstructing Multiples

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. When comparing and using multiples, estimated by someone else, it is critical that we understand how the multiples have been estimated.
- Describe the multiple
  - Too many people who use a multiple have no idea what its cross sectional distribution is. If you do not know what the cross sectional distribution of a multiple is, it is difficult to look at a number and pass judgment on whether it is too high or low.
- Analyze the multiple
  - It is critical that we understand the fundamentals that drive each multiple, and the nature of the relationship between the multiple and each variable.
- Apply the multiple
  - Defining the comparable universe and controlling for differences is far more difficult in practice than it is in theory.

# Definitional Tests

- Is the multiple consistently defined?
  - Both the value (the numerator) and the standardizing variable (the denominator) should be to the same claimholders in the firm. In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.
- Is the multiple uniformly estimated?
  - The variables used in defining the multiple should be estimated uniformly across assets in the “comparable firm” list.
  - If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.

# Ratios that are often used

- Most commonly used ratio for valuing entire firm:  
Enterprise Value / EBITDA
  - Why?
    - Abstracts from financing
    - Based on the cash thrown off by the assets
- When valuing equity alone, other ratios more common:
  - Price divided by
    - Earnings
    - Book Value of Equity
    - Sales
    - Cash Flow
  - Based on cash flows available to equity holders.

Sometimes ratios are employed that are specific to an industry:  
Enterprise Value / Megawatt; Enterprise Value / Number of Web Site Hits

# Earnings (P/E) Model

$$\text{Price}_{\text{today}} = \text{P/E Multiple}_t \times \text{EPS}_t$$

- **Example:** Firms in the Oil and Gas industry currently trades at a forward earnings multiple of 10.5. What is the relative value per share of Chevron, which also operates in the O&G industry, if analysts expect earnings to come in at \$9.10.

$$P_{\text{Chevron}} = 10.5 \times \$9.10 = \$95.55$$

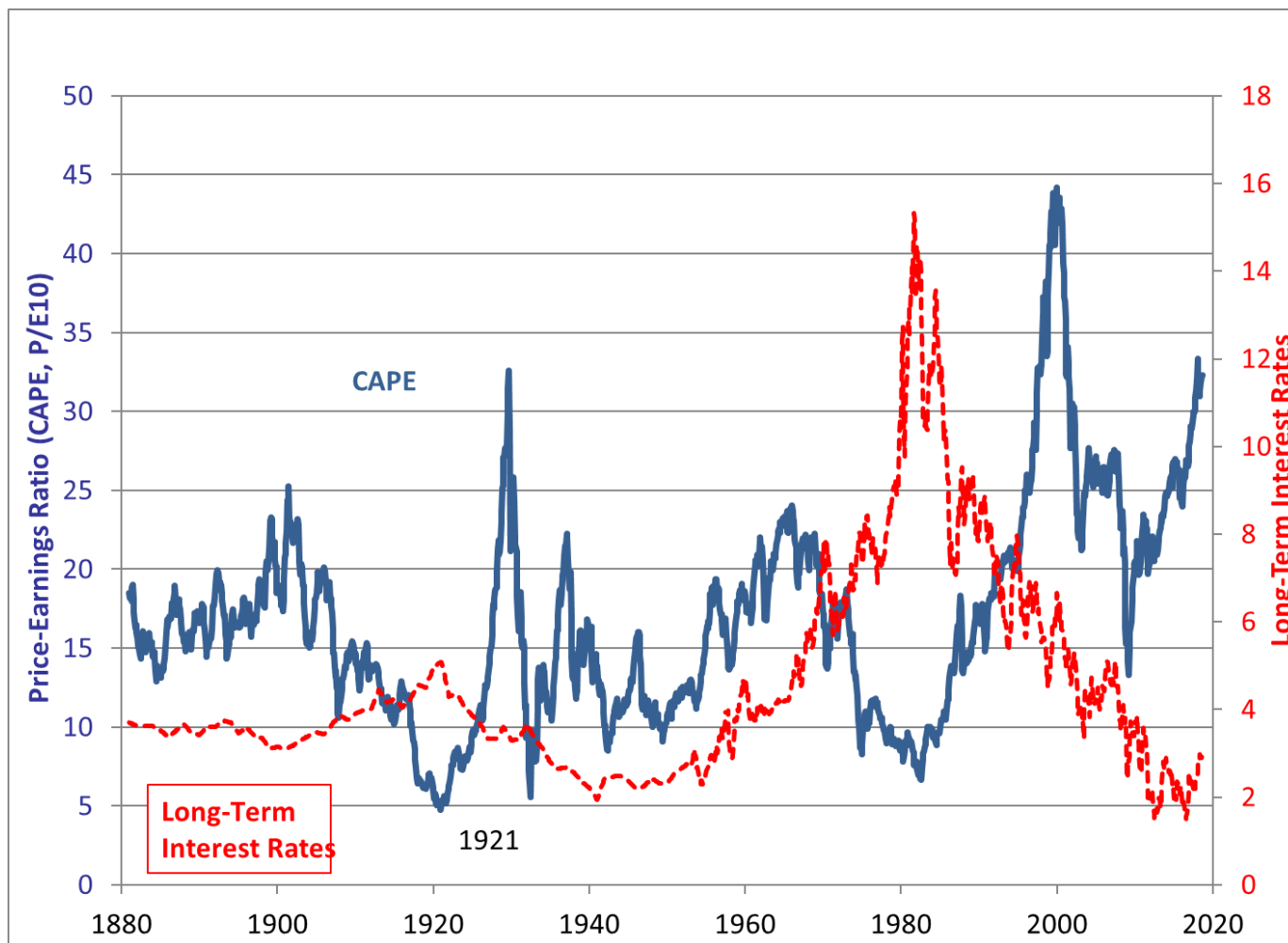
- What can you say if Chevron actually trades at \$86?



# What drives P/E ratios?

- There is large time-series variation in aggregate P/E ratios. Reflects changes in
  - $g$ : variation in technology, demographics, politics
  - $r$ : same factors affecting growth can affect risk.
- Large cross-sectional differences in P/E
  - Some industries grow faster/slower
  - Some industries riskier.

# Robert Shiller's Cyclically Adjusted P/E ratio



# Selected U.S. Companies

<b>Company</b>	<b>Price</b>	<b>P/E</b>	<b>Mkt Cap</b>
Exxon (Oil)	79.96	<b>16.3</b>	<b>340</b>
Apple	215.05	<b>19.48</b>	<b>1,039</b>
Goldman Sachs	239.34	<b>19.11</b>	<b>90</b>
Nvidia (Computer Graphics)	262.82	<b>38</b>	<b>159</b>
Kroger (Grocery)	31.74	<b>8</b>	<b>25</b>

Yahoo Finance, 08/23/2018

- What explains these differences in the Price-to-Earnings ratio over time and across companies?

# How does relative valuation compare to intrinsic valuation?

- Differ by method to compute the P/E multiple

## 1. Relative P/E

- Firms valued relative to comparable peer
- Utilizes market information
- Most widely used “on the street”

## 2. Fundamental P/E

- Based on fundamental information ( $r$ ,  $g$ , ROE)
- Derived from DDM

# Relative (P/E) Model

- Advantages:

- Simple to use, easy to understand, easy to explain
- Popular among “sell-side” analysts
- Can be a good proxy for value when earnings approximate cash flows
- Uses market information

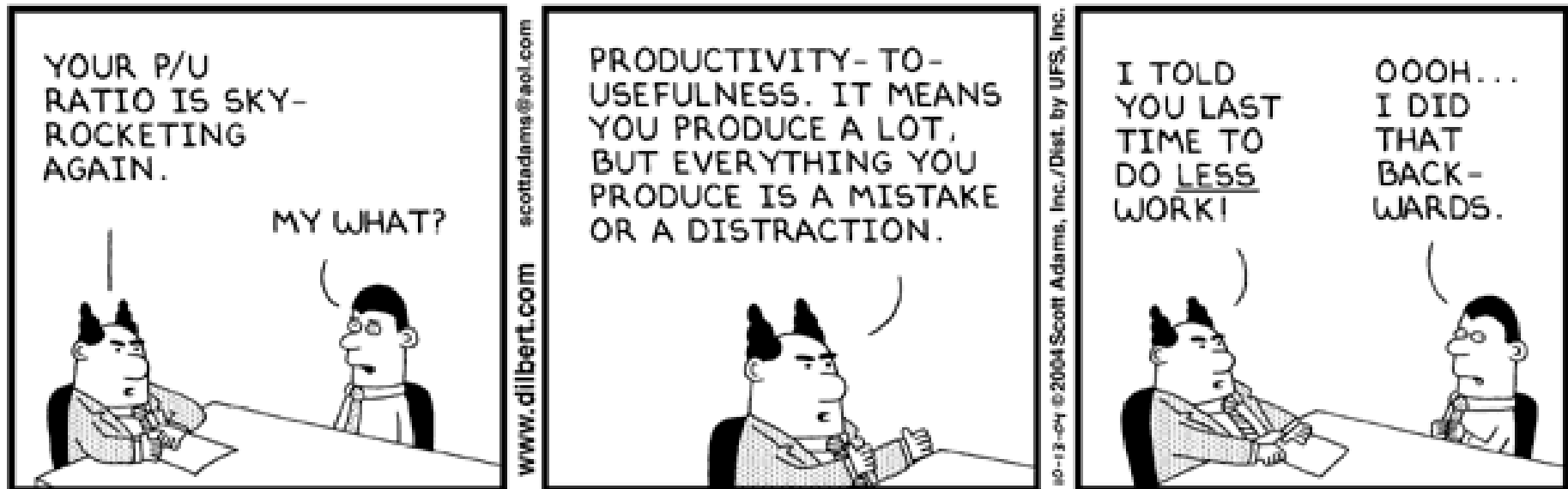
- Disadvantages:

- Short-term focus ( $EPS_1$  or  $EPS_2$ )
  - Easy to manipulate S-T earnings
- Difficult to apply to firms with
  - Negative earnings
  - High growth

Relative Valuation = Relative Mis-valuation?
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# Other Relative Value Measures

- **During Dot-Com era:** Price per million website clicks or price per customer were popular ways to value internet companies that lacked earnings/sales



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# Summing up

- DCF is the best and most commonly employed valuation technique, but comparables are also often employed
- Study the company in detail for 5-10 years, then use constant growth approach to compute a 'terminal' value
- Multiples are also commonly used to value firms
  - Be careful about applying an industry average multiple, when the firm is not like the industry average

# Key Concepts

- Intrinsic Valuation
- Dividend Discount Model
- Gordon Model
- Growth Rate Model
- Relative Valuation
- Price/Earnings Ratio



# Appendix: What drives stock prices?

- **Economic factors:**
  - Interest rates
  - Inflation
  - GDP growth
  - Consumer confidence, etc.
- **Industry factors:**
  - Competition
  - Supply & demand
- **Company factors:**
  - Sales, cash flows
  - Earnings, profit margins, etc.

# Daily Stock Price Volatility

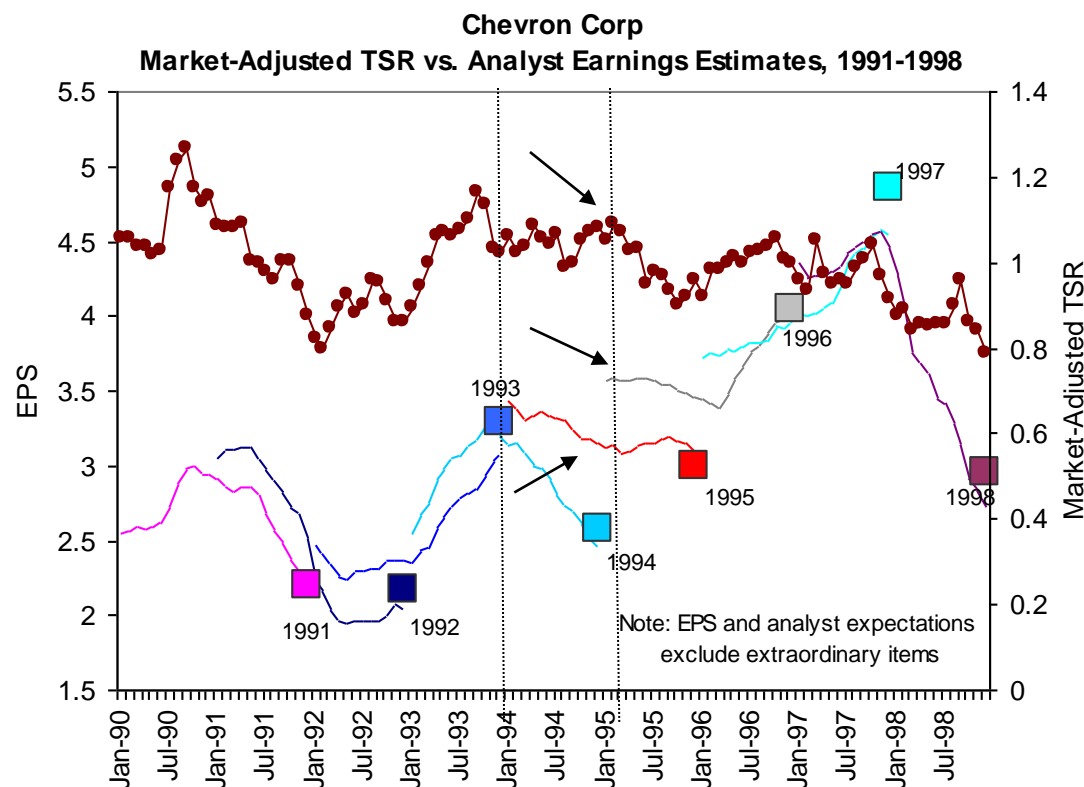
- What accounts for large day-to-day changes in stock prices?
  - A market is a collection of individuals who trade based on their ***beliefs*** about the future.
  - Thus, prices reflect investors' ***expectations*** about the ***future*** of the economy, the industry, and the firm.
  - ***Changes in aggregate expectations*** will cause prices to fluctuate.

- Equity returns depend more on *changes in expectations* than actual performance.
  - Management may provide exceptional operating returns but poor stock returns
  - Prices only rise when you exceed expectations
    - Investors pay for future performance
  - To successfully pick stocks you must identify those firms likely to do better than expected
    - Contrarian strategy

# Changes in Analyst Expectations

## Match Chevron's TSR

- During 1995, Chevron's earnings rose, but shareholder return was negative. Why? Because during the year market expectations declined.*



**Positive  
Earnings  
Growth**

**But Growth  
Below  
Expectations**

**Negative  
Shareholder  
Return**